



Armed Forces College of Medicine AFCM



Pathology of pneumonia, lung abscess and lung gangrene

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Good Morning

HAVE A GOOD DAY



INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

1. Describe the pathology and complications of lobar pneumonia
2. Describe the pathology and complications of bronchopneumonia
3. Differentiate between lobar pneumonia and bronchopneumonia

Lecture Plan



1. Part 1 (5 min) Introduction
2. Part 2 (35 min) Main lecture
3. Part 3 (5 min) Summary
4. Lecture Quiz (5 min)

Lobar Pneumonia



Definition: it is an acute diffuse fibrinous inflammation that affects all the alveoli in one or more lobules of the lung.

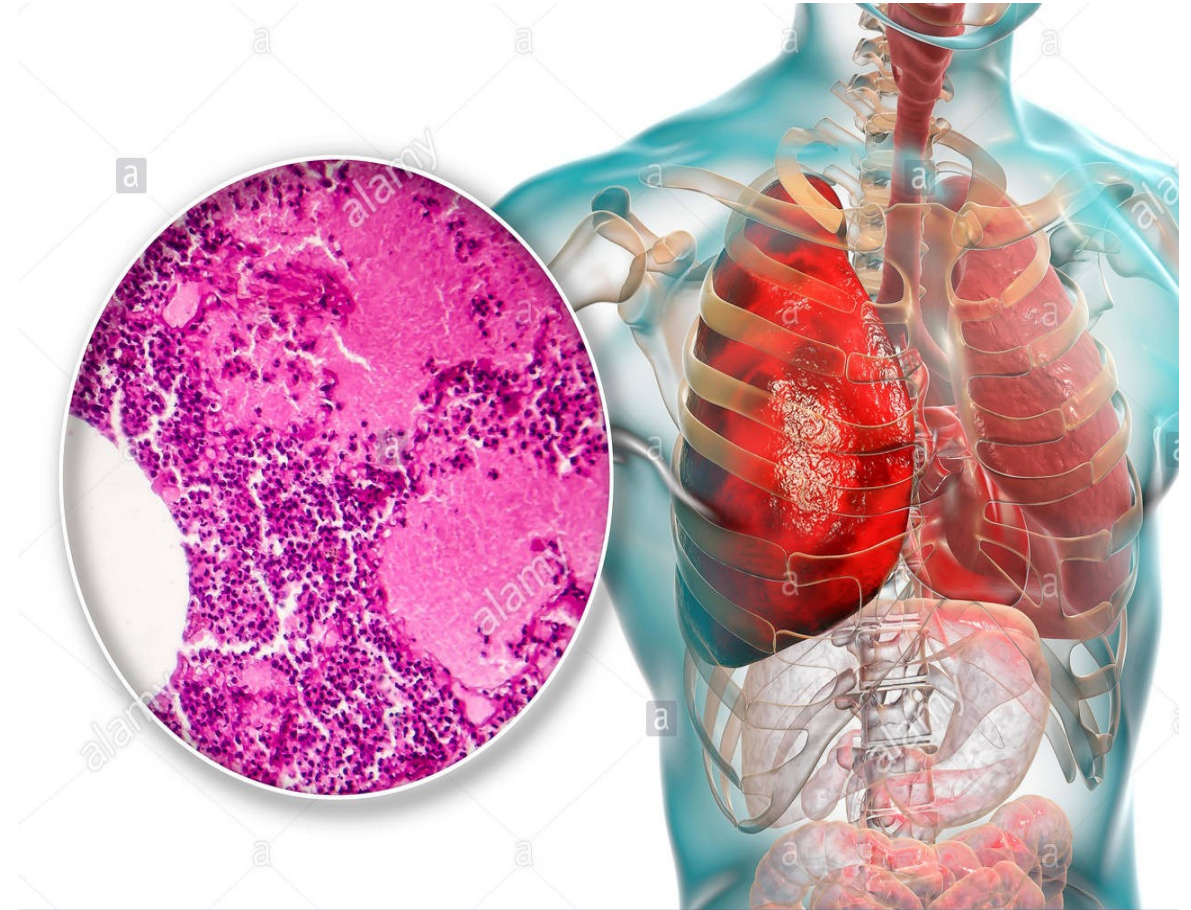
Site: the right upper lobe is most commonly affected.

Age: common in infants, children and middle age between 30 and 50 years.

Predisposing factors:

- Lowering of the body immunity.
- Upper respiratory infection.

Etiology: droplet infection by pneumococci (type I and type II).



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Pathology of Lobar Pneumonia



I- Stage of congestion: occurs within 1-2 days of infection.

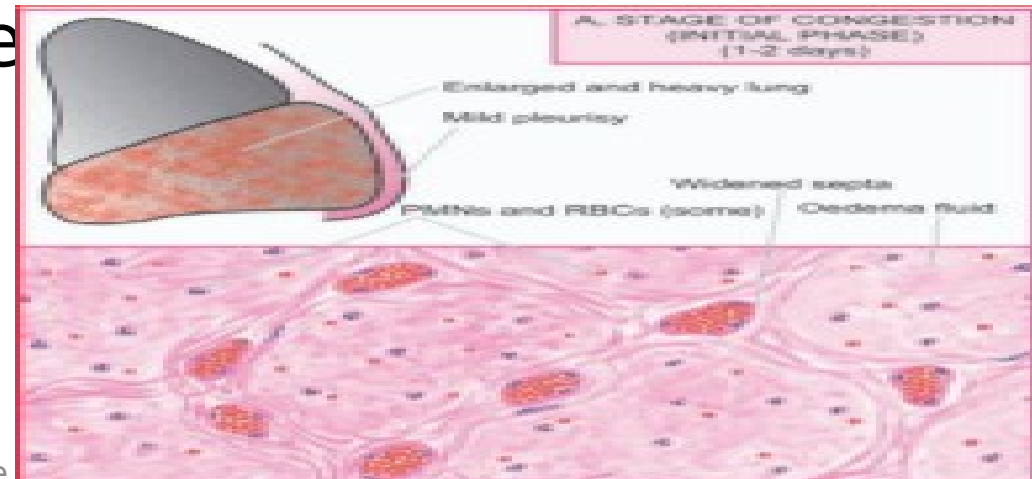
Grossly:

The affected lobe is heavy and has a reddish violet color. Its cut surface is wet and oozes frothy serous exudates.

Microscopically:

The alveolar capillaries are intense
The alveolar spaces are filled with
containing a huge number of
causative organisms.

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Pathology of Lobar Pneumonia



II- Stage of red hepatization: seen from 2nd – 4th day.

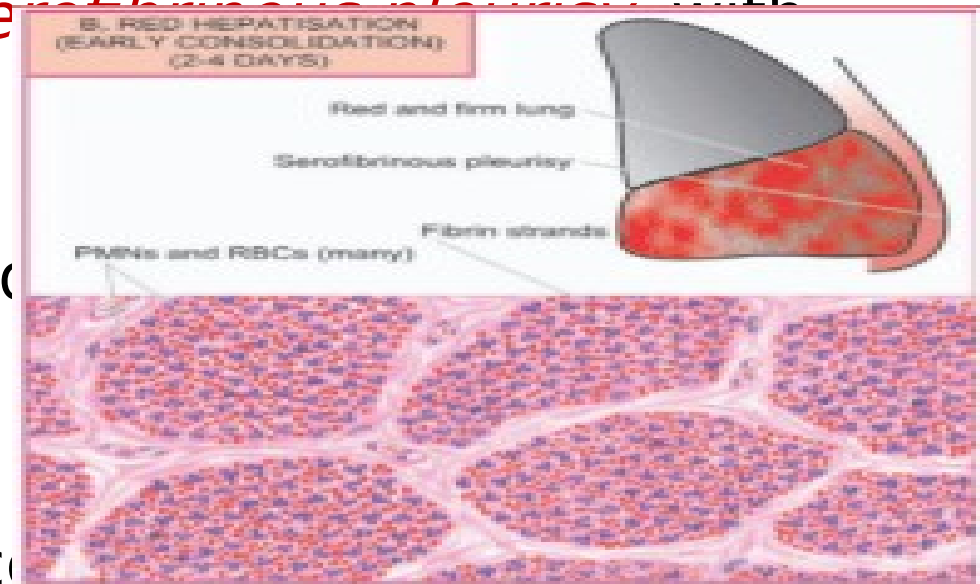
Grossly:

The affected lobe of the lung loses its spongy characters and appears like the liver; this is known as *consolidation* or *hepatization*.

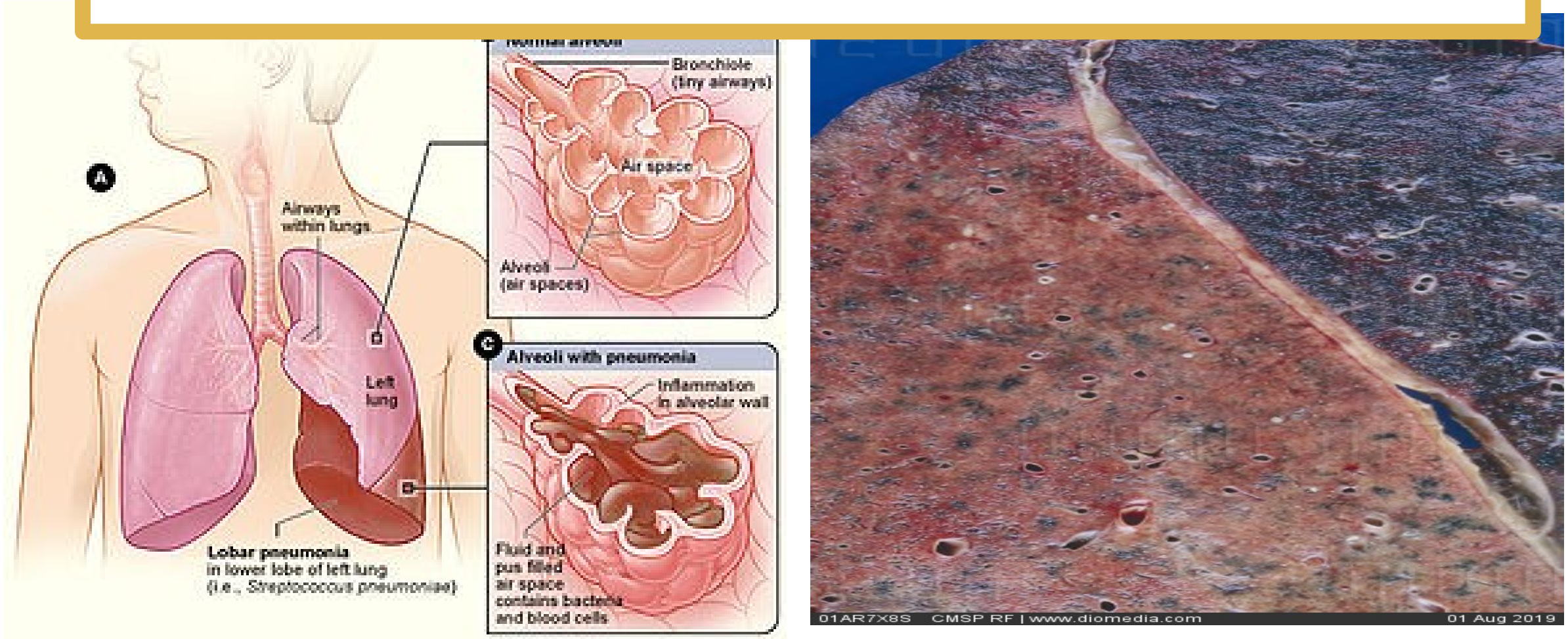
The pleura over the affected area show *serofibrinous pleurisy* with moderately enlarged hilar lymph nodes

Microscopically:

- The alveoli are filled with exudate formed of *fibrin network* entangling RBCs, polymorphs, and few lymphocytes.
- The alveolar capillaries are dilated and congested



Pathology of Lobar Pneumonia



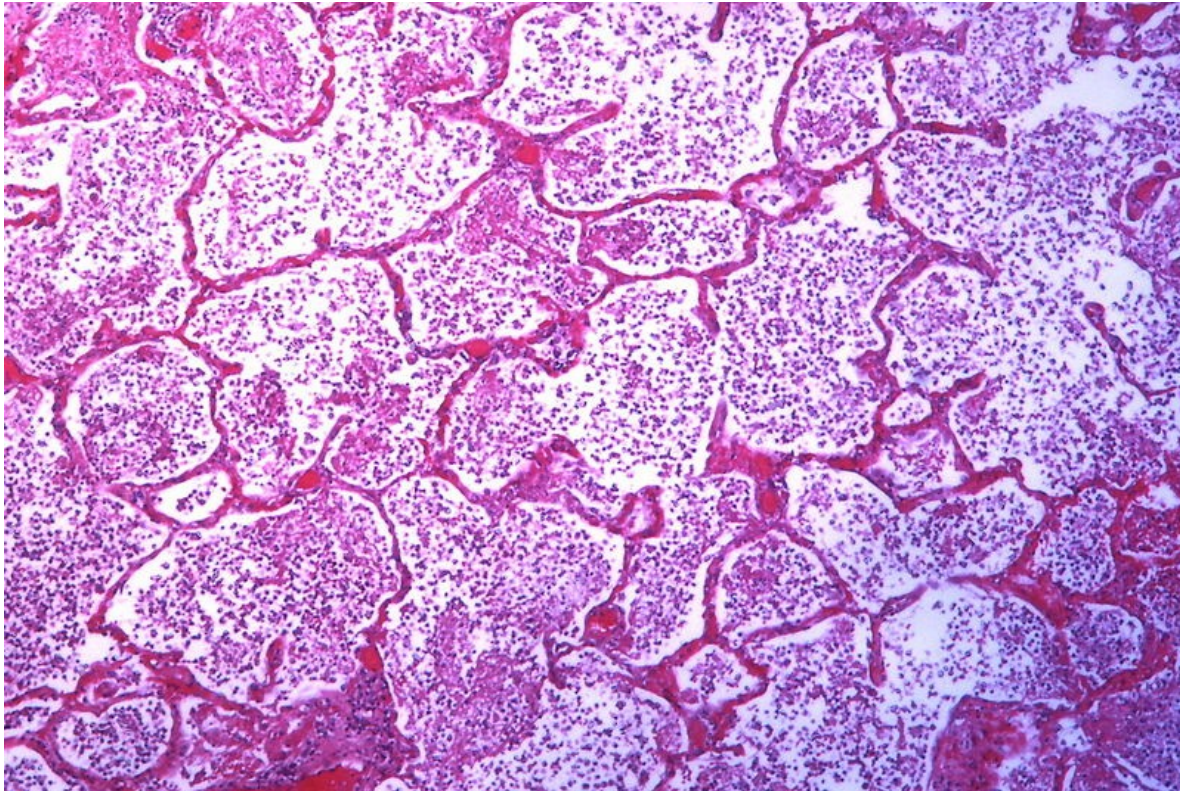
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Pathology of Lobar Pneumonia

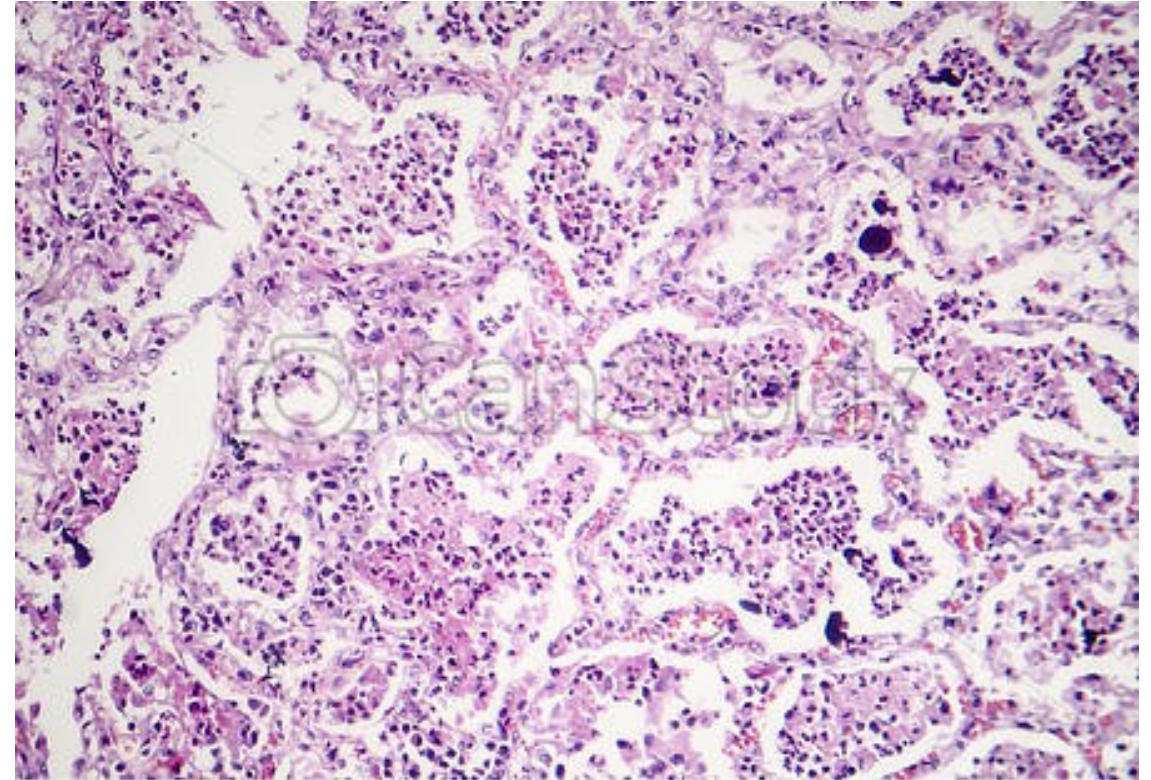


Congestion



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Hepatization



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Pathology of Lobar Pneumonia



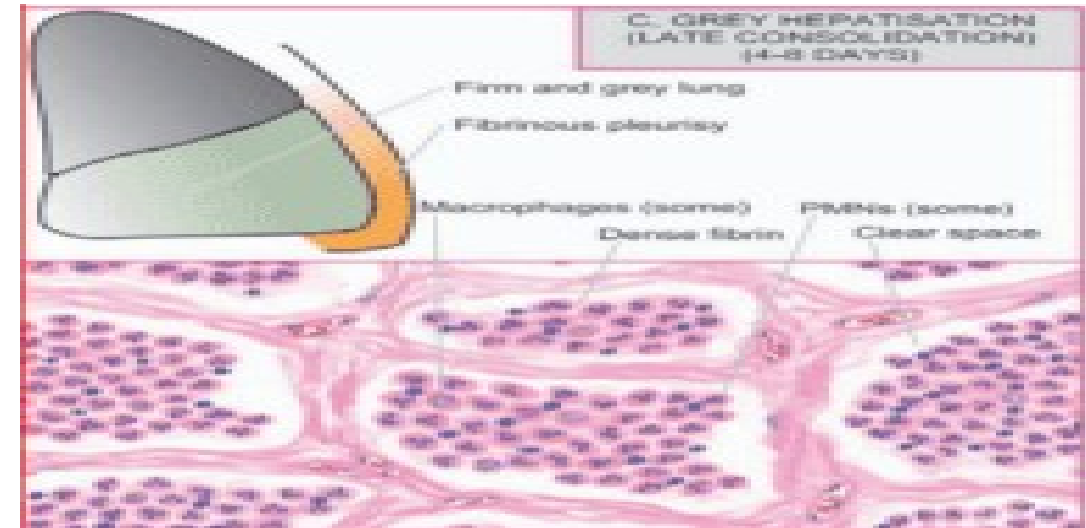
III- Stage of gray hepatization:

seen from the 4th – 8th day.

Microscopically:

The capillaries are less congested
The inflammatory cells within the alveoli lose their sharpness and become blurred, due to the action of proteolytic enzymes.

The fibrin threads are clumped into amorphous mass
the PNL are replaced by macrophages.
RBCs and organisms disappear.



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Pathology of Lobar Pneumonia

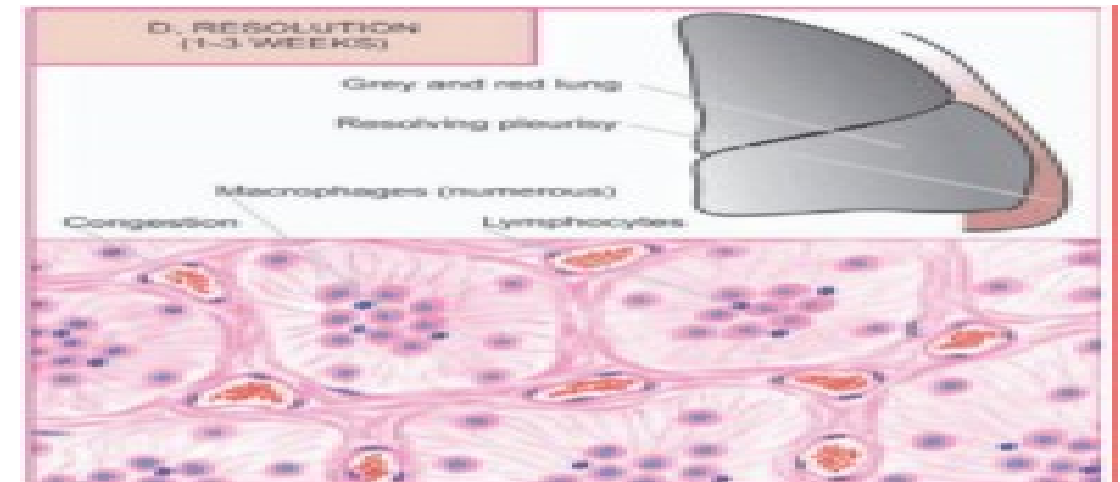


IV- Stage of resolution:

occurs from the 8th – 10th day.

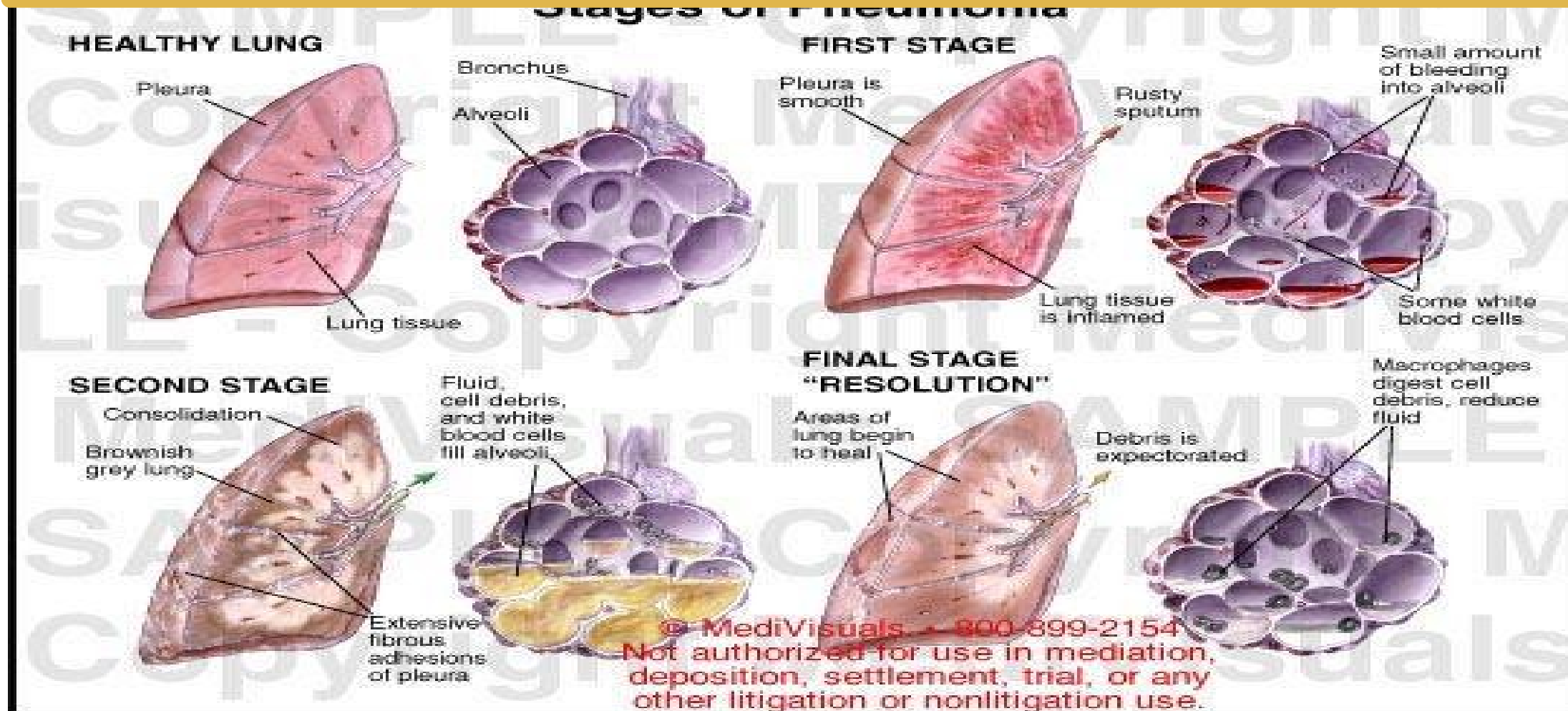
Microscopically:

There is removal of the fibrin mass and cellular elements by the action of antibiotics, macrophages and expectoration during cough. There is no necrosis of the alveolar wall.



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Pathology of Lobar Pneumonia



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Pathology of Lobar Pneumonia



Complications:

- 1- Delayed resolution.
- 2- Lung abscess and gangrene especially in diabetic patients.
- 3- Local spread causing septic endocarditis, empyema or pericarditis.
- 4- Blood spread causing meningitis, endocarditis and arthritis.
- 5- Organization of the exudates into fibrous tissue, leading to fibrosis of the affected lobe (cornification).
- 6- Toxemia causing: Toxic myocarditis [acute heart failure], venous thrombosis of leg veins and Zenker's degeneration.

Septic Bronchopneumonia



Definition: Patchy *suppurative inflammation* of the *bronchioles and surrounding alveoli*.

Etiology: streptococci, staphylococci, H influenza, pseudomonas & coliform bacilli.

Predisposing factors:

1. Occurs on top of pre-existing bronchiolitis.
2. Extremes of age like infancy and old age.
3. Low resistance as in diabetes mellitus and ca

Routes of infection:

- Endogenous from upper respirator
- Exogenous by droplet infection



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Pathology of bronchopneumonia



Grossly:

- There are multiple consolidated yellowish patches exudating ***pus*** on pressure.
- The pleura covering the consolidated patches show ***pleurisy***.
- There is ***enlargement of hilar lymph nodes***.

Microscopically:

- The walls of the affected bronchioles show congested capillaries, neutrophils, macrophages and ***pus cells***.
- The lumen contains inflammatory exudate.
- The adjacent alveoli show either alveolar inflammation with congestion, alveolar collapse or alveolar dilatation (compensatory hyperinflation).

Septic Bronchopneumonia



Complications :

- 1- Post pneumonic lung abscess and gangrene.
- 2- Spread of infection to the pleura causing empyema.
- 3- Suppurative pericarditis.
- 4- Bacteremia & pyaemia.
- 5- Toxic myocarditis.
- 6- Blood spread causing septicemia, meningitis and arthritis.

Septic Bronchopneumonia



Differences between lobar pneumonia and bronchopneumonia

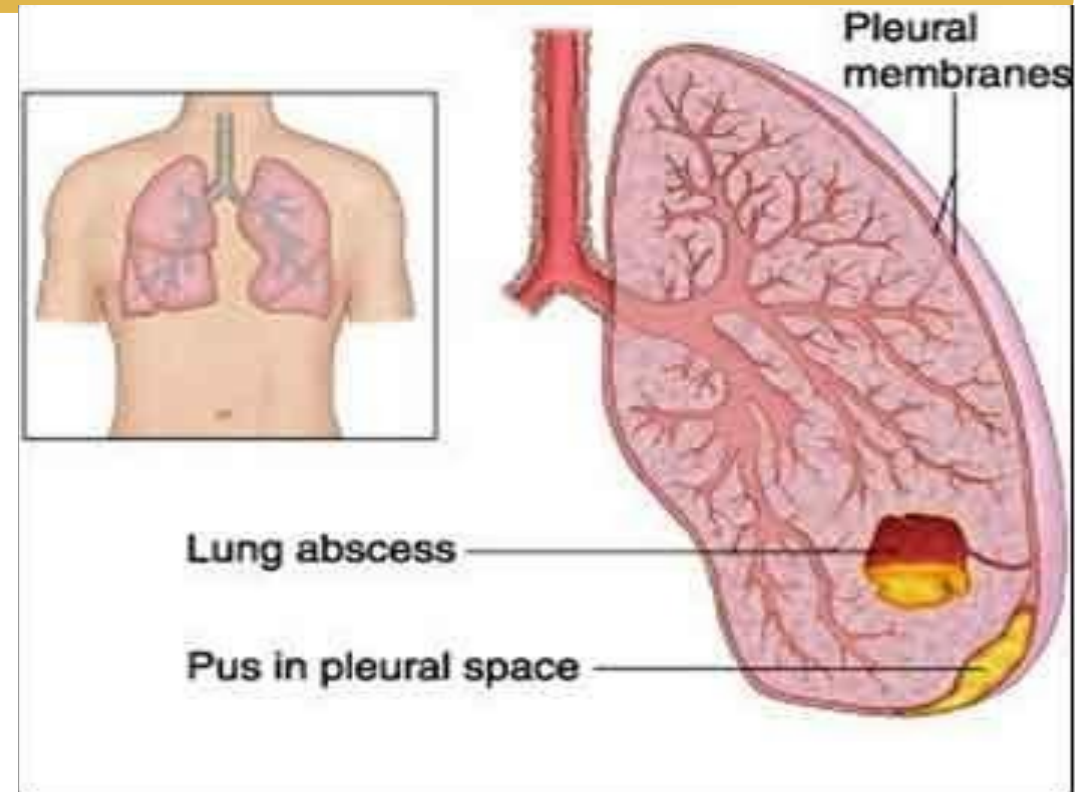
Lobar pneumonia	Bronchopneumonia
1-Diffuse fibrinous inflammation	1- Patchy suppurative inflammation
2-Usually unilateral	2-Usually bilateral
3-The lesion affects the alveoli	3-The lesions affects the bronchioles and alveoli
4-More frequent in the upper lobes	4- More frequent in the lower lobes
5-More common in the middle age	5- More common in children and elderly people
6-The onset and recovery of the disease are sudden	6- It has insidious onset and gradual recovery.
7-The disease is usually a primary one	7- It occurs as a complication of other disease

Lung Abscess



Definition: localized suppurative inflammation of the lung parenchyma characterized by formation of an irregular cavity containing pus.

Age: extremes of age but may affect young adults.



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Lung Abscess



Types :

1-Inhalation of infective materials or foreign bodies: e.g.

- a- Septic discharge from lesions in the sinuses, throat or mouth.
- b- Septic tissues and blood clots during operations on the upper respiratory tract.
- c- Aspirated vomitus while under general anesthesia.
- d- Foreign bodies.

If inhaled material is retained in the bronchi as a result of depression of the cough reflex, obstruction and suppuration occurs.

Lung Abscess



Pathology:

- The commonest type.
- It is often *single* and more common in the right lung.
- It starts as an area of aspiration pneumonia followed by breakdown of the tissues and the formation of a cavity containing pus.
- The acute abscess is lined by yellowish shreddy necrotic tissue.
- The pleura covering the abscess show ***fibrinous pleurisy***.
- If a small abscess heals completely by fibrosis.
- If a large abscess it changes to a chronic one.
- Chronic abscess is surrounded by fibrous tissue.

Lung Abscess



2- Post pneumonic lung abscess: single or multiple and affecting debilitated persons with bronchopneumonia.

Pathology: Rare type complicating lobar or septic broncho-pneumonia, single or multiple, is usually surrounded by a zone of lung consolidation.

3- Pyemic lung abscess: The septic emboli arise from thrombophlebitis, acute bacterial endocarditis..etc..

Pathology: They are multiple ,small ,bilateral, sub pleural and surrounded by a zone of congestion.

Lung Abscess



4- Post bronchiectatic lung abscess.

5- *Miscellaneous types* as those occurring due to penetrating chest injury or due to spread from osteomyelitis of a rib.

Lung Abscess

- Localized suppurative necrosis
 - Collection of pus that is walled off by chronic inflammatory / granulation tissue and fibrous tissue
- Organisms commonly cultured:
 - Staphylococci
 - Streptococci
 - Gram-negative
 - Anaerobes
 - Frequent mixed infections
- Pathogenesis:
 - Preceding pneumonia
 - Bronchial obstruction – tumour, foreign body, aspiration
 - Septic embolism



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Lung Abscess



Complications:

- 1- Hemoptysis.
- 2- Lung gangrene.
- 3- Amyloidosis
- 4- Empyema with bronchopleural fistula, pneumothorax and pyopneumothorax.
- 5- Spread of infection to other portions of the lung.
- 6- Local spread causing septic pericarditis and mediastinitis.
- 7- Blood spread of infection causing meningitis, arthritis and pericarditis.

Lung Gangrene



Etiology:

Lung gangrene complicates severe lung infections as lung abscess, lobar pneumonia, septic bronchopneumonia and bronchiectasis.

In patients with low resistance e.g. D.M., young age, old age ...etc....

It is lung necrosis followed by putrefaction

Necrosis: is caused by the bacterial toxins and thrombotic occlusion of the vessels.

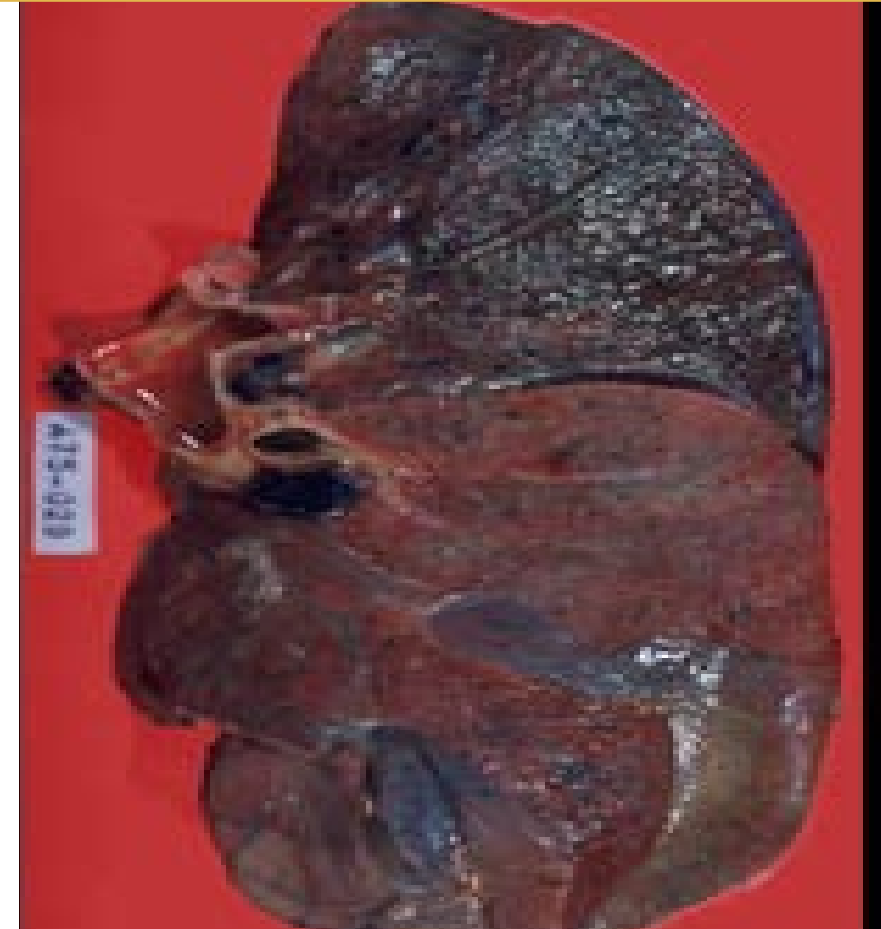
Putrefaction: is carried by the action of saprophytic anaerobic bacteria derived from the upper respiratory



Lung Gangrene

Pathology:

- 1-The affected lung appears soft, friable, moist and black.
- 2- Its odor is bad and offensive.
- 3- The vessels in the gangrenous part are destroyed causing severe hemoptysis.
- 4- The condition is rapidly fatal due to **severe toxemia** and **severe hemoptysis**.



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1- Subpleural bilateral small lung abscesses are:

- a- Post pneumonic abscesses
- b- Inhalation abscesses
- c- Systemic pyemic abscesses
- d- Portal pyemic abscesses

- **Patchy suppurative inflammation of the lung is:**

- a- Bronchopneumonia
- b- Lung abscess
- d- lobar pneumonia

SUGGESTED TEXTBOOKS



- 1- Kaplan Medical step 1, lecture notes in Pathology: Chapter 14, Respiratory system , pp. 125-143, 2017.
- 2- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 14, Respiratory system, pp. 442-488.
- 3- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 15, eye, ENT and neck, pp. 495-500
- 4- Robbins basic of Pathology, 10th ed. (2018): Chapter 13, Lung. pp. 495-549



Thank You
GOD BLESS YOU!